

# Perspectives on Informatics

## White Paper ■

### A Roadmap for National Action on Clinical Decision Support

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**Abstract** This document comprises an AMIA Board of Directors approved White Paper that presents a roadmap for national action on clinical decision support. It is published in JAMIA for archival and dissemination purposes. The full text of this material has been previously published on the AMIA Web site ([www.amia.org/inside/initiatives/cds](http://www.amia.org/inside/initiatives/cds)). AMIA is the copyright holder.

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## Introduction

This abridged AMIA Board of Directors approved presents a roadmap for national action on clinical decision support. It includes: a background, describing development of the materials; the Executive Summary; a Straw Man proposal,

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The authors acknowledge the contributions of many individuals who helped to shape and provided input on this Roadmap. Richard Singerman served as project liaison for the Office of the National Coordinator for Health Information Technology (ONC). He was involved in, and provided valuable input to, each step of planning and execution of this initiative.

Karen Greenwood and Dasha Cohen from AMIA organized the October 2005 workshop devoted to creating this Roadmap. Judy Ozbolt coordinated meeting site logistics with the Institute of Medicine. Remarks by Carolyn Clancy and David Brailer during the workshop help to shape the workshop deliberations. Many of the workshop participants provided comments on a draft workshop summary as well as two drafts of this Roadmap. In addition, other individuals provided comments during the Roadmap review process. All of these individuals are listed in Appendix 2-E.

The American College of Medical Informatics (ACMI) members devoted their January 2006 meeting to review and discussion of the ideas contained in this Roadmap and in so doing helped to inform and validate the recommended approach. Eta Berner led the program committee that organized this meeting.

Karen Bell provided thoughtful guidance on how the Roadmap could relate to other ONC initiatives. Eric Pifer helped to personalize the vision of CDS in the scenario that appears in Section II of Appendix 2. Tia Abner from AMIA assisted with the production of this document.

present as Appendix 1, and the supporting references.<sup>1–53</sup> The full text of the lengthy original AMIA Board of Directors approved White Paper is available as Appendix 2, a JAMIA online data supplement at [www.jamia.org/inside/initiatives/cds](http://www.jamia.org/inside/initiatives/cds).

Some references in this abridged version refer to sections and tables that are present only in the full document.

## Executive Summary

*Clinical decision support (CDS)* provides clinicians, staff, patients, or other individuals with knowledge and person-specific information, intelligently filtered or presented at appropriate times, to enhance health and health care.<sup>‡</sup> It encompasses a variety of tools and interventions such as computerized alerts and reminders, clinical guidelines, order sets, patient data reports and dashboards, documentation templates, diagnostic support, and clinical workflow tools. CDS has been effective in improving outcomes at some health care institutions and practice sites by making needed medical knowledge readily available to knowledge users. Yet at many other sites, CDS has been problematic, stalled in the planning stages, or never even attempted. As a result, relevant medical knowledge that should be brought to bear is not always available or used for many health care decisions in this country. This is an important contributor to the well-documented problems and sub-optimal performance of our health care system. Further, growing consumerism throughout U.S. society, along with efforts to shift the costs of care to patients and expand patient participation in health care decisions, are driving increasing patient and consumer demand for access to reliable medical information. Achieving desirable levels of patient safety, care quality, patient centeredness, and cost-effectiveness requires that the health system optimize its per-

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formance through consistent, systematic, and comprehensive application of available health-related knowledge—that is, through appropriate use of CDS.

This Roadmap recommends a series of activities to improve CDS capabilities and increase use of CDS throughout the United States health sector. The immediate goal of these activities is:

to ensure that *optimal, usable* and *effective* clinical decision support is *widely available* to providers, patients, and individuals *where and when they need it* to make health care decisions.

The ultimate goal of these activities is to improve the quality of health care services and to improve health in the United States.

## Background

In the summer of 2005, the Office of the National Coordinator for Health Information Technology (ONC) approached the American Medical Informatics Association (AMIA) with a request for a tactical plan to guide federal and private sector activities to advance Clinical Decision Support (CDS). AMIA established the CDS Roadmap Development Steering Committee to lead this effort.\*

The committee developed a framework to organize discussion on the myriad tasks and issues related to CDS. This framework was considered and reviewed in detail during and following an October 2005 workshop in Washington, DC.<sup>†</sup> As a result of these discussions, this framework evolved into the three pillars and six strategic objectives for CDS that appear in the Executive Summary shown previously.

Workshop discussions and reviews of draft versions of the Roadmap clarified the vision of next-generation CDS capabilities, and provided numerous suggestions for short-term and longer-term activities that will advance CDS. Early discussions of the American Health Information Community (AHIC) workgroups on biosurveillance, consumer empowerment, chronic care, and electronic health records (EHRs) all included reference to CDS functions for their specific breakthrough projects. These discussions also informed the Roadmap development. (See online Appendix 2 for an overview of the AHIC workgroups and CDS related functions.) In addition, an earlier version of the Roadmap was presented to the American College of Medical Informatics; discussion by this group also validated many of the recommendations in the Roadmap when they were in formative stages.

The Roadmap Development Steering Committee identified a comprehensive set of tasks that would lead to the objective of enhancing health and health care quality through widespread use of robust CDS by consumers, patients, and health care professionals (online Appendix 2, Section V). The Steering

Committee used this comprehensive plan in developing a Critical Path for CDS tasks aimed at achieving near term results with a specific focus on increasing effective use of currently available CDS interventions and demonstrating value of and potential for scalable next generation CDS capabilities (online Appendix 2, Section VI).

Given the complexity and scope of the issues associated with improving CDS in the United States, this Roadmap does not explicitly address improving CDS beyond the U.S. Other nations are also working on improving CDS as part of their national health information technology strategies (e.g., Australia, Canada, the United Kingdom). Thus, an underlying assumption of this Roadmap is that CDS efforts in the U.S. will inform and will be informed by work underway in other countries. The Roadmap Executive Steering Group (RESG) will serve as a conduit for this cross-fertilization.

The remainder of this document provides material to support the Comprehensive Work Plan and Critical Path. Online Appendix 2, Section II presents a discussion of the CDS destination expressed in terms of a future scenario, an overview of the information flow that is envisioned as supporting next generation CDS capabilities, and a framework for organizing the myriad issues and tasks that relate to CDS development. Online Appendix 2, Section III presents the case for greater attention to and investment in CDS and online Appendix 2, Section IV describes the current state of CDS. Several appendices within online Appendix 2 supplement this Roadmap with important background information including definitions of key terms used in this report, examples of CDS interventions, a description of the AHIC workgroups and potential CDS implications of each, a preliminary list of CDS-related standards, pointers to federal health information technology (HIT) programs, and a glossary of acronyms used in this report.

## Key Pillars and Objectives

The Roadmap identifies three pillars for fully realizing the promise of CDS (see Figure 1):

- **Best Knowledge Available When Needed:** the best available clinical knowledge is well organized, accessible to all, and written, stored and transmitted in a format that makes it easy to build and deploy CDS interventions that deliver the knowledge into the decision making process
- **High Adoption and Effective Use:** CDS tools are widely implemented, extensively used, and produce significant clinical value while making financial and operational sense to their end-users and purchasers
- **Continuous Improvement of Knowledge and CDS Methods:** both CDS interventions and clinical knowledge undergo continuous improvement based on feedback, experience, and data that are easy to aggregate, assess, and apply.

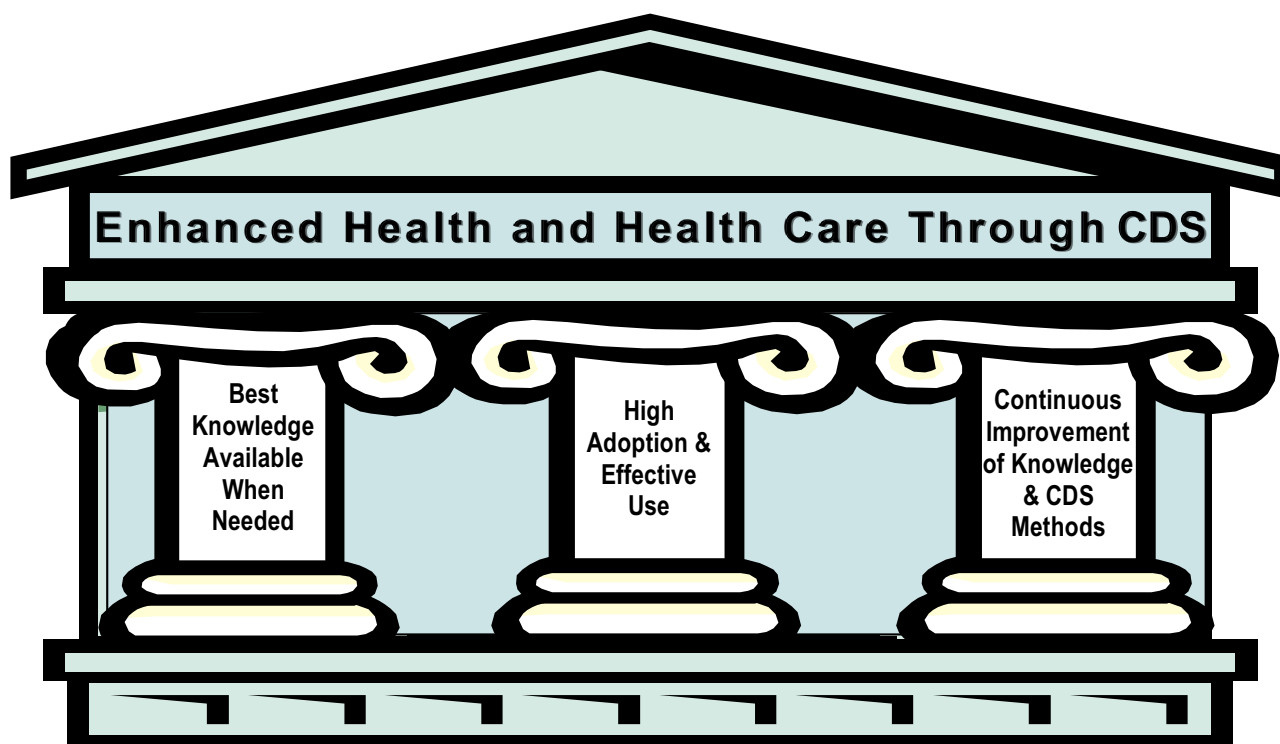
These pillars provide the framework for organizing the many issues and tasks related to getting full benefit from CDS. Each pillar comprises two strategic objectives that correspond to the key components of next-generation CDS capabilities. As a set, these strategic objectives identify the mechanisms by which this Roadmap will help realize positive changes in the health system.

### Pillar 1: Best Knowledge Available When Needed

*Strategic Objective A: Represent clinical knowledge and CDS interventions in standardized formats (both hu-*

\*ONC's sponsorship, and the initiation of the current project, arose in part from another consensus white paper project, also sponsored by ONC and the Agency for Healthcare Research and Quality (AHRQ) and executed jointly by AMIA and the Healthcare Information and Management Systems Society (HIMSS). This initial white paper identified necessary enablers for realizing the potential of CDS in electronic prescribing (Teich et al., 2005).

†A summary of this workshop is available at <http://www.amia.org/inside/initiatives/cds/>. A graphic illustrator captured the content of the workshop presentations and discussions in a visual format. These images are also available at <http://www.amia.org/inside/initiatives/cds/>.



**Figure 1.** The three pillars for realizing the promise of CDS.

man and machine-interpretable), so that a variety of knowledge developers can produce this information in a way that knowledge users can readily understand, assess, and apply it.

**Strategic Objective B: Collect, organize, and distribute clinical knowledge and CDS interventions** in one or more services from which users can readily find the specific material they need and incorporate it into their own information systems and processes.

#### **Pillar 2: High Adoption and Effective Use**

**Strategic Objective C: Address policy/legal/financial barriers and create additional support and enablers** for widespread CDS adoption and deployment.

**Strategic Objective D: Improve clinical adoption and usage of CDS interventions** by helping clinical knowledge and information system producers and implementers design CDS systems that are easy to deploy and use, and by identifying and disseminating best practices for CDS deployment.

#### **Pillar 3: Continuous Improvement of Knowledge and CDS Methods**

**Strategic Objective E: Assess and refine the national experience with CDS** by systematically capturing, organizing, and examining existing deployments. Share lessons learned and use them to continually enhance implementation best practices.

**Strategic Objective F: Advance care-guiding knowledge** by fully leveraging the data available in interoperable EHRs to enhance clinical knowledge and improve health management.

#### **Comprehensive Work Plan and Critical Path Tasks**

There are two levels of activity presented in the Roadmap—a comprehensive work plan and a critical path for CDS activities.

The Comprehensive CDS Work Plan outlines the full set of tasks needed to create a robust infrastructure for developing and delivering CDS interventions and an environment that encourages widespread successful use and continual refinement of these interventions (Section V). The Critical Path tasks represent a subset of the comprehensive work plan that can be most readily implemented and produce valuable results in the near term, and that will provide the necessary foundation for subsequent collaborations and investments needed to further build out national CDS capabilities (online Appendix 2, Section VI). This incremental approach to addressing the comprehensive work plan is considered most practical, because no public or private entity currently has the mission, resources, and strategic plan necessary to assume responsibility for the comprehensive work plan.

Key foundational elements that do not currently exist but that will be provided by the critical path tasks include: an ongoing forum for dialogue among the many CDS stakeholders, and input from those stakeholders into national initiatives for which CDS plays a critical role; consensus on the most important targets to address with CDS; and demonstration projects for successful deployment of CDS to address those targets in a manner that can be scaled nationwide.

The Critical Path Tasks include:

1. Create a focal point for CDS in the form of a Roadmap Execution Steering Group (RESG) that will stimulate, coordinate, and guide CDS efforts outlined in this Critical Path and Roadmap. The RESG mission and structure should address the need for developing and maintaining an ongoing forum for dialogue, consensus, and action by CDS stakeholders.
2. Conduct discussions with specific organizations and initiatives with a role in promoting health care quality (e.g.,



American Health Information Community (AHIC), Certification Commission for Healthcare Information Technology (CCHIT), Joint Commission on Accreditation of Healthcare Organizations (JCAHO), National Quality Forum (NQF), high profile pay for performance programs) on how CDS can advance their objectives and how such support can, in turn, facilitate execution of the tasks outlined in the Roadmap.

3. Promote dissemination and application of best CDS implementation practices through development and promotion of CDS implementation guides and lessons learned from successful sites as a means of increasing use of currently available CDS interventions.
4. Develop specifications and find funding for a set of coordinated, collaborative projects aimed at demonstrating the feasibility, scalability, and value of a robust approach to CDS using a focused, top priority target. For example, pilot initiatives could include using specific, standardized CDS interventions and integration strategies, and best practice implementation approaches, to increase medication safety or effective management of high-impact clinical conditions such as diabetes or congestive heart failure (Appendix 1).
5. Implement at least one of these scalable, outcome-enhancing CDS demonstration projects.
6. Analyze and generalize lessons learned from demonstration projects.
7. Address initial legal, regulatory, and financial issues that impact broader dissemination of CDS.
8. Identify next steps for broader CDS development and implementation as an outgrowth of the activities above.

In online Appendix 2, Sections I through IV of the Roadmap provide the context for the Comprehensive Work Plan and Critical Path. They present a description of the process used to develop this document, a vision for next generation CDS capabilities, the case for greater attention to and investment in CDS, and an analysis of the current state of CDS.

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## Appendix 1. Straw Man Proposal for Demonstration of Scalable, Outcome-enhancing CDS

As work proceeds on the strategies and innovations outlined in this paper, pilot demonstration projects can serve to test and illustrate their impact. The goal of this initiative is to demonstrate the feasibility of implementing CDS *outside* of benchmark organizations, in a systematic manner that can drive predictable improvements in health outcomes *and* be readily deployed in a variety of health care settings.

The target scenario for the project applies CDS to improve safe and effective medication use and/or enhance management and outcomes for high-impact chronic diseases such as congestive heart failure or diabetes.

Specific deliverables from the pilot initiatives will include the following prototypes, models, and activities:

1. standard, highly practical formats for representing relevant medical knowledge, developed with CDS application in mind;
2. standard formats for general types of CDS interventions to convey this knowledge that can be readily incorporated into a variety of clinical information systems;
3. a knowledge service that collects, organizes, and makes available validated knowledge and specific interventions related to the target conditions in standard format;
4. proof of concept implementation of the above standards and services in multiple health care settings and in a variety of clinical information systems;
5. an organized collection of best practices for deploying CDS interventions reliably and successfully to improve outcomes in the targeted areas;
6. measurement and assessment of the usage of the above interventions, and an evaluation of their impact on patient care processes and outcomes, specifically on safety, efficiency, cost, and quality of care;
7. documentation of issues critical to successfully generalizing the lessons learned from these pilot initiatives to broader deployment of CDS (e.g., to support other conditions, other goals, other situations) and recommendations for successful scaling of benefits.

These pilot efforts will bring together representatives from a variety of stakeholder organizations, including provider organizations, informatics laboratories, commercial clinical information system and clinical decision support suppliers, government agencies and national organizations focused on health care quality, and standards organizations.

An initial core group of key stakeholders, subsequently expanded to a broader more fully representative group as project resources allow, will begin to refine the specifications of these demonstration initiatives and identify potential test sites.